BALLISTIC & CRUISE MISSILE THREAT

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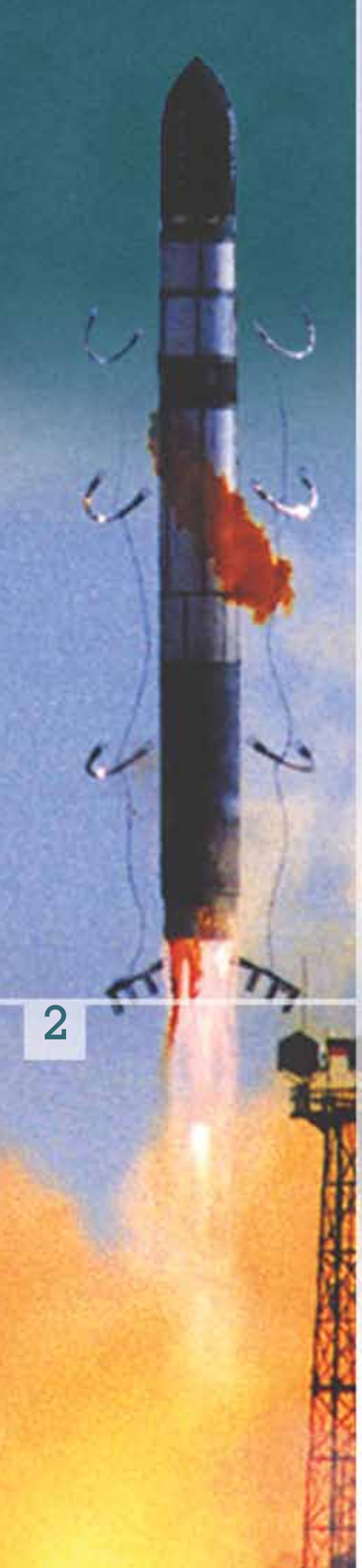

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KEY FINDINGS

Many countries view ballistic and cruise missile systems as cost-effective weapons and symbols of national power. In addition, they present an asymmetric threat to US airpower. Many ballistic and cruise missiles are armed with weapons of mass destruction.

North Korea has unveiled the new road-mobile Hwasong-13 intercontinental ballistic missile (ICBM) while continuing to develop the Taepo Dong-2 (TD-2), which placed a satellite in orbit for the first time in December 2012. An intermediate-range ballistic missile (IRBM) and a new solid-propellant short-range ballistic missile (SRBM) are also being developed.

Iran could develop and test an ICBM capable of reaching the United States by 2015. Since 2008, Iran has conducted multiple successful launches of the two-stage Safir space launch vehicle (SLV) and has also revealed the larger two-stage Simorgh SLV, which could serve as a test bed for developing ICBM technologies. Since 2010, Iran has revealed the Qiam-1 SRBM, the fourth-generation Fateh-110 SRBM, and claims to be mass-producing antiship ballistic missiles (ASBMs). Iran has modified its Shahab 3 medium-range ballistic missile (MRBM) to extend its range and effectiveness and also claims to have deployed the two-stage, solid-propellant Sejjil MRBM.

China has the most active and diverse ballistic missile development program in the world. It is developing and testing offensive missiles, forming additional missile units, qualitatively upgrading missile systems, and developing methods to counter ballistic missile defenses. The Chinese ballistic missile force is expanding in both size and types of missiles. China continues to field conventionally armed SRBMs opposite Taiwan, and is developing a number of new mobile, conventionally armed MRBMs. Missiles such as the CSS-5 ASBM are key components of the Chinese military modernization program, specifically designed to prevent adversary military forces' access to regional conflicts. China is adding the CSS-10 Mod 2 (DF-31A) to the ICBM force and future ICBMs could utilize multiple independently-targetable reentry vehicles (MIRVs). The number of Chinese ICBM nuclear warheads capable of reaching the United States could expand to well over 100 within the next 15 years. The new JL-2 submarine-launched ballistic missile (SLBM) is also under development.

India and Pakistan continue to develop new SRBMs and long-range ballistic missiles. The Indian Agni IV IRBM has been flight tested twice since 2010, and India conducted the first flight test of the Agni V ICBM in April 2012. An even longer ranged Agni VI is reportedly in the design phase.

Russia still has over 1,400 nuclear warheads deployed on ballistic missiles capable of reaching the United States. Although the size of the Russian strategic missile force is shrinking due to arms control limitations and resource constraints, development of new ICBM and SLBM systems is proceeding, and Russia is expected to retain the largest force of strategic ballistic missiles outside the United States. Russia tested a new type of ICBM in 2012 and is nearing deployment of the new Bulava SLBM. Russian officials have stated a new liquid-propellant ICBM is also under development.

Land-attack cruise missiles (LACMs) are highly effective weapon systems that can present a major threat to military operations. At least nine foreign countries will be involved in LACM production during the next decade, and many missiles will be available for export.

THREAT HISTORY

Ballistic and cruise missiles present a significant threat to US and Allied forces overseas, and to the United States and its territories. Missiles are attractive to many nations because they can be used effectively against an adversary with a formidable air defense system, where an attack with manned aircraft would be impractical or too costly. In addition, missiles can be used as a deterrent or an instrument of coercion. Missiles also have the advantage of fewer maintenance, training, and logistic requirements than manned aircraft. Even limited use of these weapons could have devastating consequences because missiles can be armed with chemical, biological, or nuclear warheads.

The ballistic and cruise missile threat continues to increase with the proliferation of missile technology. Over 20 countries have ballistic missile systems, and missiles likely will be a threat in future conflicts involving US forces. Ballistic missiles have been used in several conflicts over the last 30 years, including the Iran-Iraq war, the Afghan civil war, the war in Yemen, the 1991 and 2003 Persian Gulf conflicts, the Russian military actions in Chechnya and Georgia, and most recently in the conflict within Syria. Although LACMs have not yet been widely proliferated, as many as 20 countries could possess cruise missiles in the next decade.

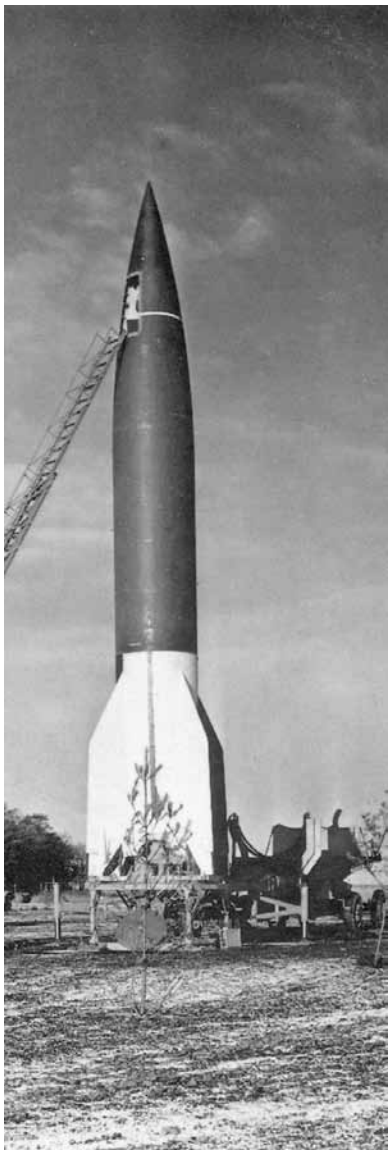
V-1 Prior to Impact in London

Guided cruise and ballistic missiles were first used when Germany attacked targets in England and Northern Europe with V-1 cruise missiles and V-2 ballistic missiles during World War II. Although these missiles were inaccurate, their use resulted in tens of thousands of Allied casualties.

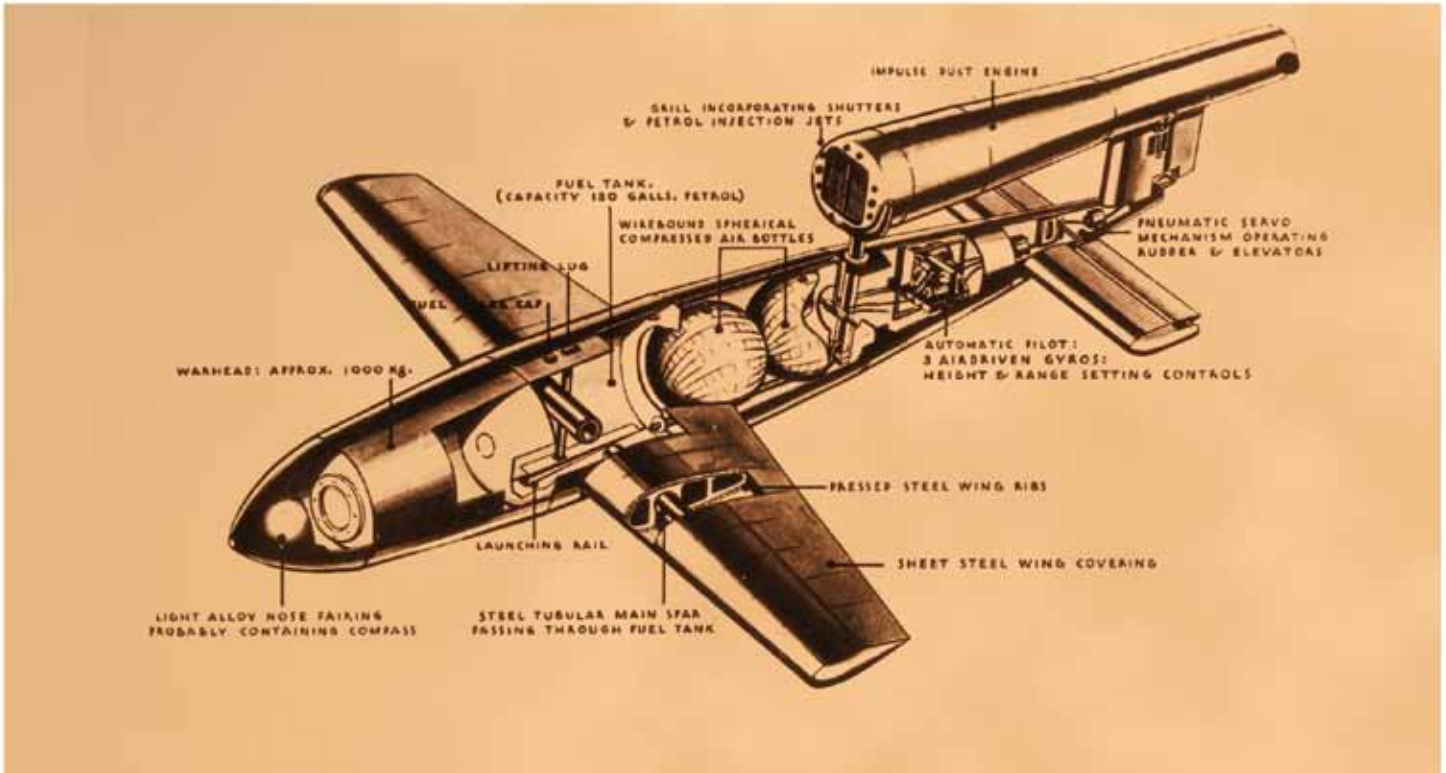
The US Air Force, in cooperation with the other services, is responsible for countering the ballistic and cruise missile threat through deterrence and, if necessary, active suppression. Threat suppression may include attacks on missile systems, both before launch and in flight, and attacks on their supporting infrastructure. This document includes information on some of the major current and projected foreign ballistic and cruise missile systems.

Guided cruise and ballistic missiles were first used when Germany attacked targets in England and Northern Europe with V-1 cruise missiles and V-2 ballistic missiles during World War II. Although these missiles were inaccurate, their use resulted in tens of thousands of Allied casualties.

V-2 damage; 160 People were Killed in this Attack



V-2 Ballistic Missile



WARHEADS & TARGETS

Ballistic and cruise missiles can be armed with conventional or nonconventional warheads. Conventional warheads are filled with a chemical explosive, such as TNT, and rely on the detonation of the explosive and the resulting metal casing fragmentation as kill mechanisms. Nonconventional warheads include weapons of mass destruction (nuclear, biological, and chemical weapons) and nonlethal warheads, a relatively new class of warhead designed to disable equipment rather than harm personnel. Conventional, biological, and chemical weapons can be packaged in unitary (single) warheads and in submunitions (multiple small bomblets that are released at altitude to disperse over a wide area).

Conventional warheads can be optimized for specific types of targets. For example, submunitions can be used to create craters in an airfield runway or destroy armored vehicles. A penetrator warhead, which uses a relatively small amount of explosive surrounded by a heavy metal casing, can pass through a hardened structure, such as a bunker, to destroy its contents.

Russian SS-25 ICBM

Chemical and biological weapons can be packaged in submunitions to be dispersed over a wide area.

Many long-range ballistic missiles and several types of LACMs carry nuclear warheads. Most of these warheads have an explosive force that is tens to hundreds of times more powerful than the atomic bombs used in World War II.

Chemical and biological weapons are attractive to many Third World countries because they are much easier to produce than nuclear weapons, and many countries with chemical and biological warfare programs also are equipped with ballistic and/or cruise missiles. Accuracy is not very important for these weapons when used against urban areas or large concentrations of military forces. Chemical and biological weapons can be packaged in submunitions to be dispersed over a wide area. They are capable of producing massive casualties, inducing panic and chaos in civilian populations, and severely degrading military operations.

MIRV of the Decommissioned Soviet SS-20 IRBM

Iranian Qiam-1 SRBM

Chinese DF-15 SRBM

BALLISTIC MISSILES

Operational ballistic missiles are deployed in silos, on submarines, and on land-mobile launchers. Mobile missiles are favored by many nations because they can be hidden, greatly increasing their survivability.

Many SRBMs remain intact until the warhead detonates. In longer range ballistic missiles, warheads are contained in separating reentry vehicles (RVs). Some long-range ballistic missiles carry MIRVs, with up to 10 RVs per missile. RVs reenter the Earth's atmosphere at very high velocities, on the order of 4-5 miles per second at ICBM ranges.

Ballistic missiles can use solid- or liquid-propellant rocket propulsion systems. The trend in modern missile systems has been toward the use of solid propellants because of their reduced logistical requirements and simplicity of operation. However, some less developed nations have greater access to liquid-propellant technology and, therefore, continue to develop new liquid-propellant missiles. Russia is also developing a new liquid-propellant missile.

Multiple-stage missiles, with each stage having its own independent propulsion system, are more efficient for longer range missions. ICBMs typically have two or three stages, with powerful liquid-propellant engines or solid-propellant motors to propel the payload toward its target, and a postboost vehicle (PBV) with a much smaller propulsion system. A PBV can be used to improve the RV deployment accuracy for a single-RV missile. For a missile with a MIRV payload, the PBV is used to release RVs so that they follow different trajectories, allowing them to hit separate targets. Some MIRV missiles can hit targets separated by over 1,500 kilometers with a single missile.

A ballistic missile with a high-quality inertial guidance system is capable of delivering an RV within a few hundred feet of the target after a flight of over 9,500 kilometers. For many missiles, accuracy

The trend in modern missile systems has been toward the use of solid propellants because of their reduced logistical requirements and simplicity of operation. However, some less developed nations have greater access to liquid-propellant technology and, therefore, continue to develop new liquid-propellant missiles.

can be greatly improved by utilizing satellite-aided navigation. Missiles also can use maneuvering RVs with terminal sensors to attain very high accuracy. The use of terminal sensors and a maneuver capability can allow ballistic missiles to attack moving targets such as ships at sea, but an antiship mission requires a sophisticated intelligence, surveillance, and reconnaissance system to support missile targeting.

As more modern guidance technology is proliferated, countries will be able to improve the accuracy and lethality of their missile forces. However, even a missile with a guidance system only accurate enough to hit a large city is capable of inflicting massive casualties when armed with a weapon of mass destruction.

Many ballistic missiles carry penetration aids to improve the chances of an RV penetrating a ballistic missile defense system. Penetration aids are devices intended to deceive or jam sensors used to detect and track missiles and RVs. They are of increasing importance to countries developing and operating ballistic missiles.

Multiple Chinese SRBMs on Parade

North Korean TD-2 ICBM/SLV

MISSILE RANGE

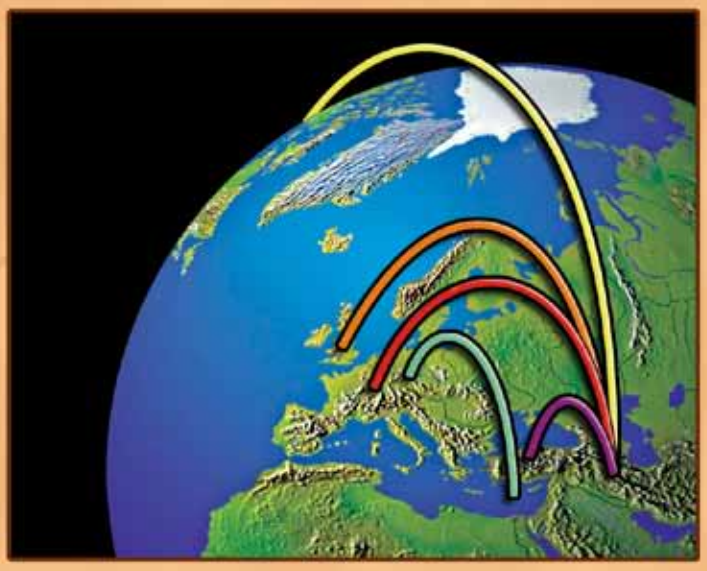
Short-range ballistic missile
<1,000 km (621 mi)

Medium-range ballistic missile
1,000-3,000 km (621-1,864 mi)

Intermediate-range ballistic missile
3,000-5,500 km (1,864-3,418 mi)

Intercontinental ballistic missile
>5,500 km (3,418 mi)

Submarine-launched ballistic missile
Any ballistic missile launched from a submarine, regardless of maximum range



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SHORT-RANGE BALLISTIC MISSILES

Several countries are now producing and/or developing SRBM systems, while many other countries have purchased missiles or missile technologies from one or more of the missile producers.

The Russian SS-1c Mod 1, also called the SCUD B, has been exported to more countries than any other type of guided ballistic missile, and has proven to be a versatile and adaptable weapon. For example, the Iraqi SCUD missiles used during the 1991 Persian Gulf War had been modified to double their range. North Korea has produced its own version of the SCUD B and the SCUD C, which is an extended-range version of the SCUD B.

Although the SCUD was originally designed as a tactical battlefield support weapon, many countries view it and other SRBM systems as strategic weapons to be used against urban areas. Iraq used extended-range SCUD missiles as strategic weapons during both the Iran-Iraq war and the 1991 Persian Gulf War. Other countries could modify SCUD missiles to significantly improve their accuracy and use them against high-value military targets and cities.

New SRBM systems are in development in several countries. China has deployed a very large force of modern solid-propellant SRBMs in the vicinity of Taiwan, and according to Taiwanese government officials, China has recently started to deploy a new SRBM known as the Dong Feng 16 (DF-16/CSS-11 Mod 1). In August 2010, Iranian officials hailed the successful test firing of the liquid-fuel Qiam-1 surface-to-surface missile. Around the same time, the Iranian Minister of Defense told reporters that the third-generation of the Fateh-110 missile had been successfully test fired and that the system was officially delivered to the missile force in September 2010. In 2012,

Some SRBM developers have already begun to develop countermeasures such as maneuvering RVs, and are expected to continue countermeasure development.

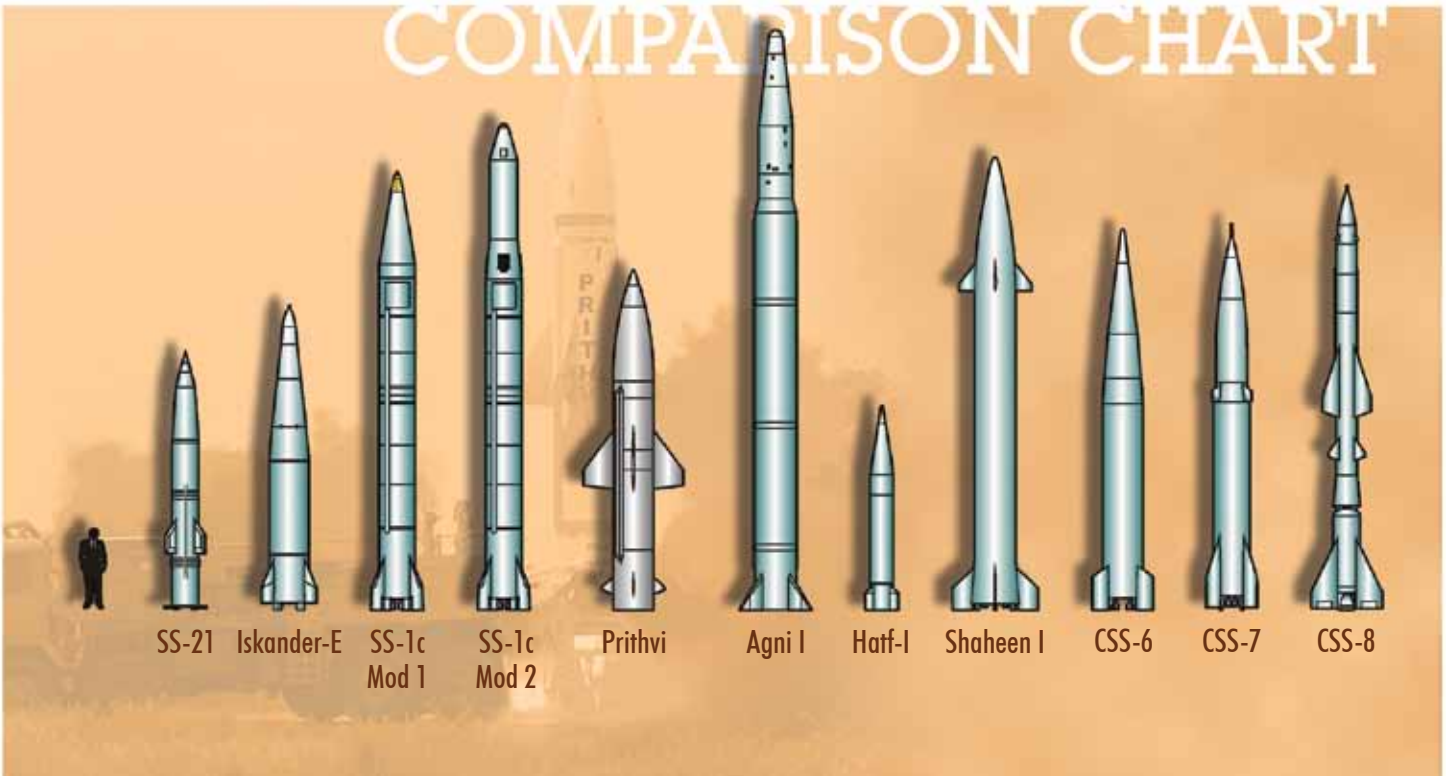
srbm

Iran claimed to have also successfully flight tested a fourth-generation Fateh-110. Iran has also flight tested an ASBM variant of its Fateh-110 missile. A seeker has likely been added to the missile to improve the system's accuracy against sea-based targets.

Recent conflicts have highlighted missile defense capabilities and provided the incentive for continued missile defense development, in turn, motivating ballistic missile developers to pursue missile defense countermeasures. Some SRBM developers have already begun to develop countermeasures such as maneuvering RVs, and are expected to continue countermeasure development.

Pakistani Hatf-9 SRBM Launch

Indian Dhanush SRBM Launch



Pakistani Ghaznzvi SRBM Launch

Iranian Fateh-110 SRBM

Chinese CSS-6 SRBM

Developmental Pakistani Abdali (Hatf-2) SRBM

srbm

CHARACTERISTICS

MISSILE	PROPELLANT	DEPLOYMENT MODE	MAXIMUM RANGE (km)	Number of Launchers (By Country)*
RUSSIA				Fewer than 200
SCUD B (SS-1c Mod 1)	Liquid	Road-mobile	300	
SS-1c Mod 2	Liquid	Road-mobile	240+	
SS-21 Mod 2	Solid	Road-mobile	70	
SS-21 Mod 3	Solid	Road-mobile	120	
SS-26	Solid	Road-mobile	300	
Iskander-E	Solid	Road-mobile	280	
CHINA				More than 200
CSS-11 Mod 1	Solid	Road-mobile	800+	
CSS-6 Mod 1	Solid	Road-mobile	600	
CSS-6 Mod 2	Solid	Road-mobile	850+	
CSS-6 Mod 3	Solid	Road-mobile	725+	
CSS-7 Mod 1	Solid	Road-mobile	300	
CSS-7 Mod 2	Solid	Road-mobile	600	
CSS-8	Solid/Liquid	Road-mobile	150	
CSS-9 Mod 1	Solid	Road-mobile	150	
CSS-9 Mod-X-2	Solid	Road-mobile	260	
CSS-14 Mod-X-1	Solid	Road-mobile	150	
CSS-14 Mod-X-2	Solid	Road-mobile	280	
CSS-X-16	Solid	Road-mobile	200	
CSS-X-15	Solid	Road-mobile	280	
NORTH KOREA				Fewer than100
SCUD B	Liquid	Road-mobile	300	
SCUD C	Liquid	Road-mobile	500	
Toksa	Solid	Road-mobile	120	
ER SCUD	Liquid	Road-mobile	700-995	
INDIA				Fewer than 75
Prithvi I	Liquid	Road-mobile	150	
Prithvi II	Liquid	Road-mobile	250	
Dhanush	Liquid	Ship-based	400	
Agni I	Solid	Road-mobile	700	
PAKISTAN				Fewer than 50
Hatf-9	Solid	Road-mobile	60	
Hatf-1	Solid	Road-mobile	50	
Shaheen I	Solid	Road-mobile	750	
Ghaznavi	Solid	Road-mobile	250	
IRAN				Fewer than100
Fateh-110	Solid	Road-mobile	200-300	
Shahab 1	Liquid	Road-mobile	300	
Shahab 2	Liquid	Road-mobile	500	
CSS-8 (M-7)	Solid/Liquid	Road-mobile	150	
Qiam -1	Liquid	Road-mobile	unknown	
SYRIA				Fewer than100
SCUD D	Liquid	Road-mobile	700	

Note: All ranges are approximate.

* The missile inventory may be larger than the number of launchers; launchers can be reused to fire additional missiles

mr/
irbm

MEDIUM-RANGE & INTERMEDIATE-RANGE BALLISTIC MISSILES

New MRBM and/or IRBM systems are in development in China, North Korea, Iran, India, and Pakistan. These are strategic systems, and many will be armed with nonconventional warheads. All of these countries except Iran have tested nuclear weapons. Neither Russia nor the United States produce or retain any MRBM or IRBM systems because they are banned by the Intermediate-Range Nuclear Forces Treaty, which entered into force in 1988.

China continues to maintain regional nuclear deterrence, and its long-term, comprehensive military modernization is improving the capability of its ballistic missile force to conduct high-intensity, regional military operations, including "anti-access and area denial" (A2/AD) operations. The term A2/AD refers to capabilities designed to deter or counter adversary forces from deploying to or operating within a defined space. Currently, China deploys the nuclear armed CSS-2, CSS-5 Mod 1, and CSS-5 Mod 2 for regional nuclear deterrence. China is also acquiring new conventionally armed CSS-5 MRBMs to conduct precision strikes. These systems are likely intended to hold at-risk or strike logistics nodes, regional military bases including airfields and ports, and naval assets. Notably, China has likely started to deploy the DF-21D, an ASBM based on a variant of the CSS-5.

North Korea has an ambitious ballistic missile development program and has exported missiles and missile technology to other countries, including Iran and Pakistan. North Korea has also admitted its possession of nuclear weapons. It has displayed new IRBMs and older No Dong MRBMs in recent military parades.

Iran's Shahab 3 and Sejjil can reach targets at a distance of about 2,000 km.

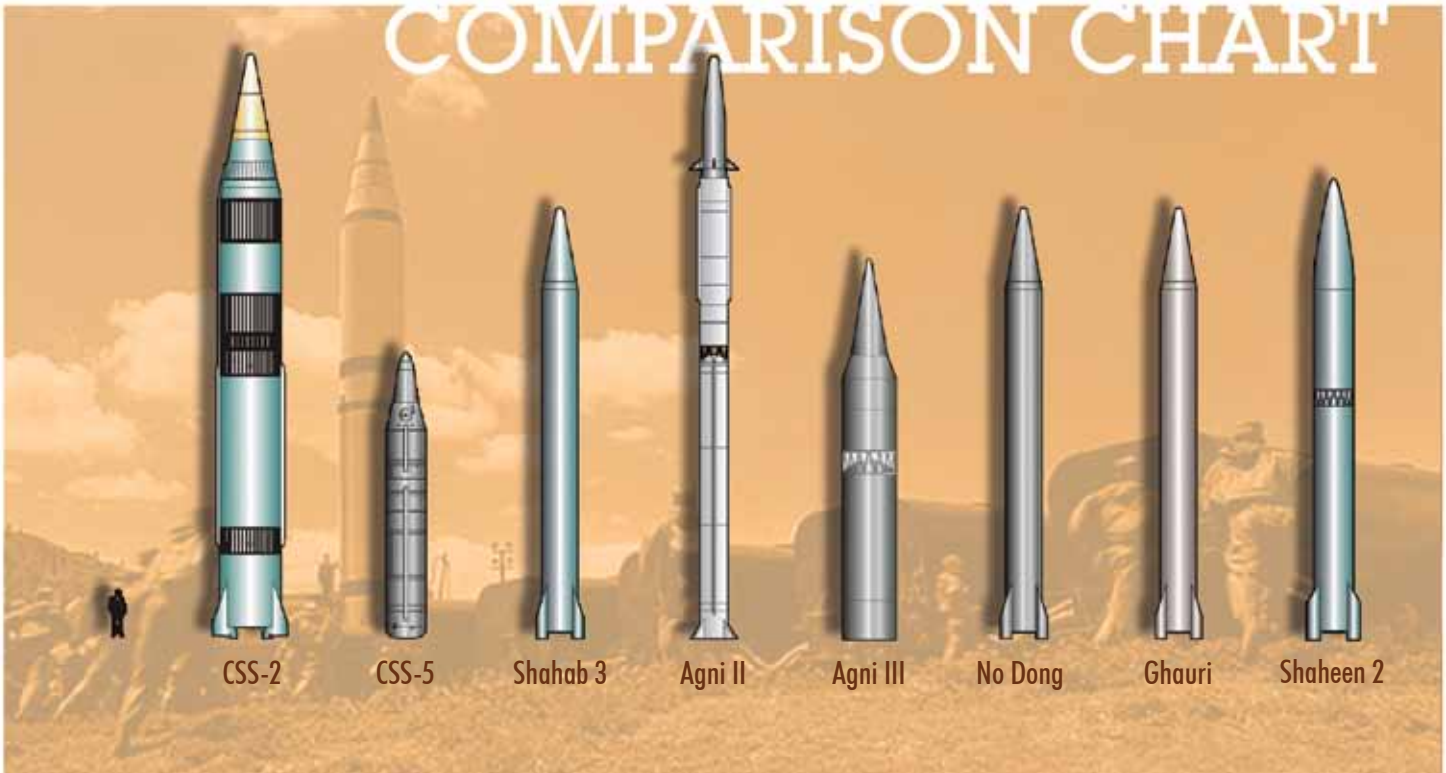
mr/irbm

Iran has an extensive missile development program, and has received support from entities in Russia, China, and North Korea. The Iranian Shahab 3 MRBM is based on the North Korean No Dong missile. Iran has modified the Shahab 3 to extend its range and effectiveness, with the longest range variant reportedly being able to reach targets at a distance of about 2,000 km. Iran also claims to have mass-produced Shahab 3 missiles. Iranian solid-propellant rocket and missile programs are also progressing. Iran has conducted multiple launches of the Sejjil, a solid-propellant MRBM with a claimed range of 2,000 km. In addition, Iran has conducted multiple launches of the Safir, a multi-stage SLV that can serve as a test bed for long-range ballistic missile technologies.

India continues to develop and improve its ballistic missiles. All of India's long-range missiles use solid propellants. Indian officials have stated that the Agni II MRBM is deployed. The Agni III IRBM has been flight tested four times since 2006, and has been pronounced ready for deployment. The Agni IV IRBM has been flight tested twice since 2010, with the 2011 launch successful.

Pakistan continues to improve the readiness and capabilities of its Army Strategic Force Command and individual strategic missile groups through training exercises that include live missile firings. Pakistan has tested its solid-propellant Shaheen 2 MRBM six times since 2004, and this missile system probably will soon be deployed.

Indian Agni IV IRBM Launch



Iranian Sejjil MRBM

Chinese CSS-5 MRBM Road-Mobile Launcher

Indian Agni III IRBM

North Korean No Dong MRBM

m/irbm CHARACTERISTICS

MISSILE	NUMBER OF STAGES	PROPELLANT	DEPLOYMENT MODE	MAXIMUM RANGE (km)	NUMBER OF LAUNCHERS*
China					
CSS-2	1	Liquid	Transportable	3,000	5 to 10 (Limited Mobility)
CSS-5 Mod 1	2	Solid	Road-mobile	1,750+	Fewer than 50
CSS-5 Mod 2	2	Solid	Road-mobile	1,750+	Fewer than 50
CSS-5 Conventional	2	Solid	Mobile	1,750+	Fewer than 30
CSS-5 ASBM	2	Solid	Mobile	1,500+	Unknown
Saudi Arabia (Chinese-produced)					
CSS-2 (conventional)	1	Liquid	Transportable	3,000	Fewer than 50 (Limited Mobility)
North Korea					
No Dong	1	Liquid	Road-mobile	1,250	Fewer than 50
IRBM	1	Liquid	Road-mobile	3,000+	Fewer than 50
India					
Agni II	2	Solid	Rail-mobile	2,000+	Fewer than 10
Agni III	2	Solid	Rail-mobile	3,200+	Not yet deployed
Agni IV	2	Solid	Rail-mobile	3,500+	Not yet deployed
Pakistan					
Ghauri	1	Liquid	Road-mobile	1,250	Fewer than 50
Shaheen 2	2	Solid	Road-mobile	2,000	Unknown
Iran					
Shahab 3	1	Liquid	Silo & road-mobile	2,000	Fewer than 50
Sejjil	2	Solid	Road-mobile	2,000	Unknown
IRBM/ICBM	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined

Note: All ranges are approximate.
* The missile inventory may be larger than the number of launchers; launchers can be reused to fire additonal missiles

Iranian Sejjil MRBM Launch

Iranian Shahab 3 MRBM in a Silo

INTERCONTINENTAL BALLISTIC MISSILES

Russia retains about 1,200 nuclear warheads on ICBMs. Most of these missiles are maintained on alert, capable of being launched within minutes of receiving a launch order. Although the size of the Russian ICBM force will continue to decrease because of arms control agreements, aging missiles, and resource constraints, Russia probably will retain the largest ICBM force outside the United States. Efforts to maintain and modernize the force are underway. Russia successfully tested a new type of mobile ICBM in 2012 according to Russian press reports. The Russian SS-27 Mod 1 ICBM, a missile designed with countermeasures to ballistic missile defense systems, is now deployed in silos in six regiments. Russia began deployment of the road-mobile version of the SS-27 Mod 1 in 2006. A MIRV version of the SS-27, the SS-27 Mod-2 (RS-24), was deployed in 2010. In addition, Russian officials claim a new class of hypersonic vehicle is being developed to allow Russian strategic missiles to penetrate missile defense systems, and the Russian press has indicated deployment of a new rail-mobile ICBM is being considered. Furthermore, Russia has stated that a new heavy liquid-propellant ICBM is under development to replace the aging SS-18. Russia's goal is to begin its deployment in the 2018-2020 timeframe.

In 2011, the New Strategic Arms Reduction Treaty, which limits the United States and Russia to no more than 1,550 warheads each (including those on ICBMs, SLBMs, and heavy bombers), entered into force.

China is strengthening its strategic nuclear deterrent force with the development and deployment of new ICBMs. China retains a relatively small number of nuclear armed, liquid-propellant CSS-3 limited range ICBMs and CSS-4 ICBMs capable of reaching the United States. It is also modernizing its nuclear forces by adding more survivable, road-mobile delivery systems. Both the road-mobile,

In 2011, the New Strategic Arms Reduction Treaty, which limits the United States and Russia to no more than 1,550 warheads each (including those on ICBMs, SLBMs, and heavy bombers), entered into force.

icbm

solid-propellant CSS-10 Mod 1 and the longer range CSS-10 Mod 2 ICBMs have been deployed to units within the Second Artillery Corps. The CSS-10 Mod 1 is capable of reaching targets throughout Europe, Asia, and parts of Canada and the northwestern United States. The longer range CSS-10 Mod 2 will allow targeting of most of the continental United States. China may also be developing a new road-mobile ICBM capable of carrying a MIRV payload, and the number of warheads on Chinese ICBMs capable of threatening the United States is expected to grow to well over 100 in the next 15 years.

North Korea continues development of the TD-2 ICBM/SLV, which could reach the United States if developed as an ICBM. Launches in July 2006, April 2009, and April 2012 ended in failure, but a December 2012 launch successfully placed a satellite in orbit. In an April 2012 military parade, North Korea unveiled the new Hwasong-13 road-mobile ICBM. This missile has not yet been flight tested. Either of these systems could be exported to other countries in the future. Continued efforts to develop the TD-2 and the newly unveiled ICBM show the determination of North Korea to achieve long-range ballistic missile and space launch capabilities.

Since 2008, Iran has conducted multiple successful launches of the two-stage Safir SLV. In early 2010, Iran unveiled the larger Simorgh SLV. Iran will likely continue to pursue longer range ballistic missiles and more capable SLVs, which could lead to the development of an ICBM system. Iran could develop and test an ICBM capable of reaching the United States by 2015.

India conducted the first flight test of the Agni V ICBM in April 2012. An even longer range Agni VI is reportedly in the design phase.

Russian SS-25 ICBM launch

Russian SS-18 ICBM Launch

North Korean Hwasong-13 ICBM

Chinese CSS-10 ICBM Road-Mobile Launchers

Russian SS-27 ICBM Road-Mobile Launcher

icbm CHARACTERISTICS

MISSILE	NUMBER OF STAGES	WARHEADS PER MISSILE	PROPELLANT	DEPLOYMENT MODE	MAXIMUM RANGE (km)	NUMBER OF LAUNCHERS*
Russia						
SS-18 Mod 5	2 + PBV	10	Liquid	Silo	10,000+	About 50
SS-19 Mod 3	2 + PBV	6	Liquid	Silo	9,000+	About 50
SS-25	3 + PBV	1	Solid	Road-mobile	11,000	More than 150
SS-27 Mod 1	3 + PBV	1	Solid	Silo & road-mobile	11,000	About 80
SS-27 Mod-2	3 + PBV	Multiple	Solid	Silo & road-mobile	11,000	About 20
New ICBM	At least 2	Undetermined	Solid	Road-mobile	5,500+	Not yet deployed
China						
CSS-3	2	1	Liquid	Transportable	5,5000+	10 to 15
CSS-4 Mod 1	2	1	Liquid	Silo	12,000+	About 20
CSS-10 Mod 1	3	1	Solid	Road-mobile	7,000+	5 to 10
CSS-10 Mod 2	3	1	Solid	Road-mobile	11,000+	More than 15
North Korea						
Taepo Dong-2	2 or 3	1	Liquid	Fixed	5,500+	Unknown**
Hwasong-13	Undetermined	Undetermined	Undetermined	Road-mobile	5,500+	Unknown
India						
Agni V	3	1	Solid	Undetermined	5,000+	Not yet deployed

Note: All ranges are approximate.
* The missile inventory may be much larger than the number of launchers; launchers can be reused to fire additional missiles.
** Launches of the TD-2 space vehicle have been observed from both east and west coast facilities.

Russian SS-25 ICBM Road-Mobile Launcher

Indian Agni V ICBM Launch

SUBMARINE-LAUNCHED BALLISTIC MISSILES

Russia maintains a substantial force of nuclear powered ballistic missile submarines (SSBNs) with intercontinental-range missiles. Russia is developing new and improved SLBM weapon systems to replace its current inventory of Cold War vintage systems. Upgraded SS-N-23s are intended to replace older SS-N-23s on DELTA IV Class SSBNs. The SS-NX-32/Bulava is a new solid-propellant SLBM that is primarily intended for deployment on new DOLGORUKIY class SSBNs. Russian SLBMs are capable of launch from surfaced and submerged SSBNs from a variety of launch locations.

China currently has a single XIA Class SSBN that is intended to carry 12 CSS-NX-3/JL-1 missiles. In addition, China will deploy the new CSS-NX-14/JL-2 SLBM on new 12-tube JIN Class SSBNs. This

Chinese JIN-Class Ballistic Missile Submarine

Russia maintains a substantial force of nuclear powered ballistic missile submarines (SSBNs) with intercontinental-range missiles. Russia is developing new and improved SLBM weapon systems to replace its current inventory of Cold War vintage systems.

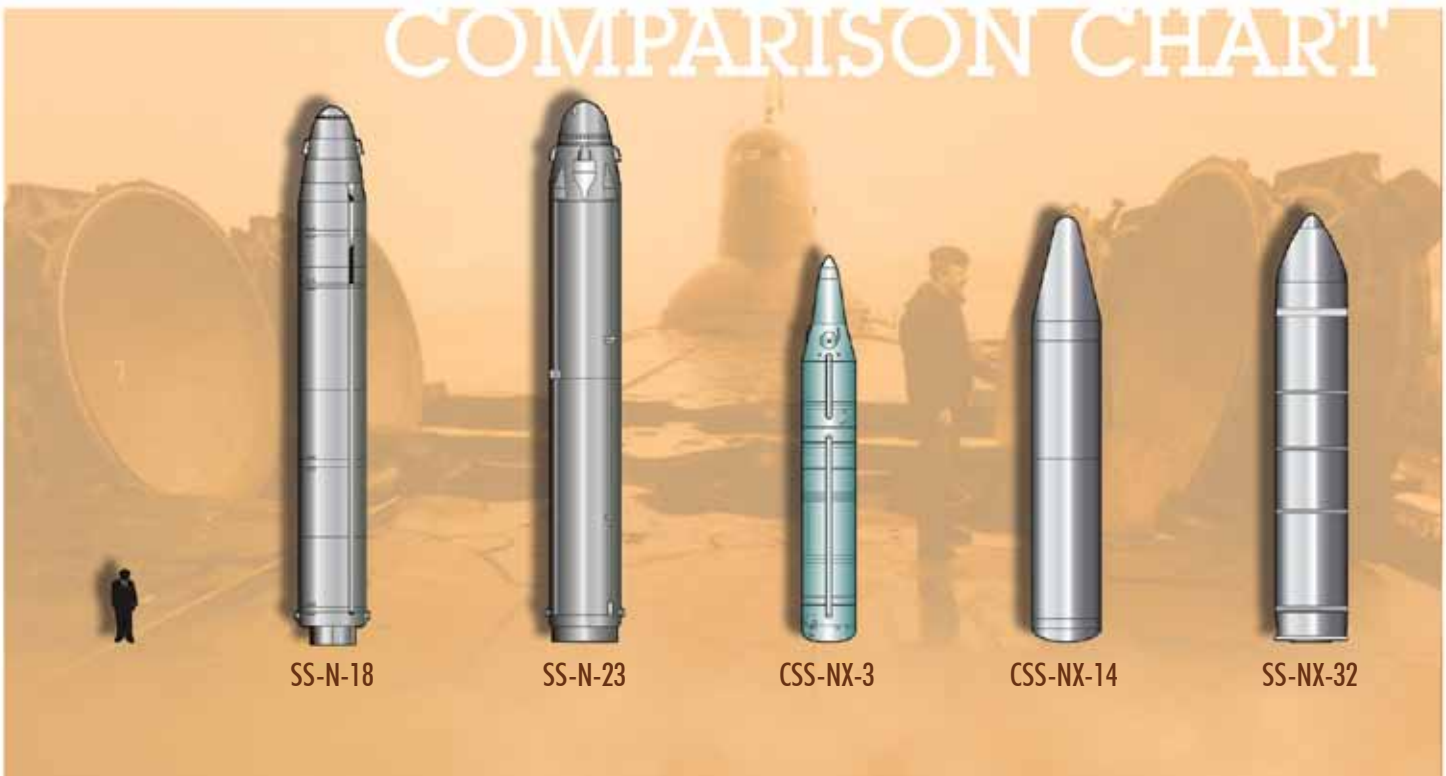
slbm

missile will, for the first time, allow Chinese SSBNs to target portions of the United States from operating areas located near the Chinese coast.

India is developing a new ballistic missile-capable submarine, the INS Arihant. The K-15 is reportedly ready for induction when the Arihant is deemed ready.

Each Russian TYPHOON SSBN Carried 20 SS-N-20 SLBMs

Chinese CSS-NX-3 SLBM Launch



Chinese CSS-NX-3 SLBM Launch

Russian Bulava SLBM Launch

Chinese CSS-NX-3 SLBM Launch Sequence

Russian SS-N-18 SLBM

The Chinese XIA SSBN can Carry 12 CSS-NX-3 SLBMs

slbm CHARACTERISTICS

MISSILE	NUMBER OF STAGES	WARHEADS PER MISSILE	PROPELLANT	SUBMARINE CLASS	MAXIMUM RANGE (km)	NUMBER OF LAUNCHERS
RUSSIA						
SS-N-18	2 + PBV	3	Liquid	DELTA III	5,500+	96
SS-N-23	3 + PBV	4	Liquid	DELTA IV	8,000+	96
SS-NX-32 Bulava	3 + PBV	6	Solid	DOLGORUKIY (BOREY)	8,000+	16; Not yet deployed
				TYPHOON		20; Not yet deployed
CHINA						
CSS-NX-3/JL-1	2	1	Solid	XIA	1,700+	12; Not yet deployed
CSS-NX-14/JL-2	3	1	Solid	JIN	7,000+	12; Not yet deployed
INDIA						
K-15	2	1	Solid	ARIHART	700	12; Not yet deployed

Note: All ranges are approximate.

Each Russian Delta IV SSBN can Carry 16 SS-N-23 SLBMs

Russian DOLGORUKIY Class SSBN at Sea

Russian SS-N-20 SLBM Launch

LAND-ATTACK CRUISE MISSILES

Unlike ballistic missiles, cruise missiles are usually categorized by intended mission and launch mode (instead of maximum range). The two broadest categories are LACMs and antiship cruise missiles. Each type can be launched from an aircraft, ship, submarine, or ground-based launcher.

A LACM is an unmanned, armed aerial vehicle designed to attack a fixed or mobile ground-based target. It spends the majority of its mission in level flight, as it follows a preprogrammed path to a predetermined target. Propulsion is usually provided by a small jet engine.

Because of highly accurate guidance systems that can place the missile within a few feet of the intended target, the most advanced LACMs can be used effectively against very small targets, even when armed with conventional warheads. LACM guidance usually occurs in three phases: launch, midcourse, and terminal. During the launch phase, a missile is guided using only the inertial navigation system. In the midcourse phase, a missile is guided by the inertial navigation system updated by one or more of the following systems: a radar-based terrain contour matching system, a radar or optical scene matching system, and/or a satellite navigation system such as the US Global Positioning System or the Russian Global Navigation Satellite System. The terminal guidance phase begins when a missile enters the target area and uses either more accurate scene matching or a terminal seeker (usually an optical or radar-based sensor).

Defending against LACMs will stress air defense systems. Cruise missiles can fly at low altitudes to stay below enemy radar and, in some cases, hide behind terrain features. Newer missiles are incorporating stealth features to make them even less visible to radars and infrared detectors. Modern cruise missiles also can be programmed to approach and attack a target in the most

The cruise missile threat to US forces will continute to increase. At least nine foreign countries will be involved in LACM production during the next decade, and several of the LACM producers will make their missiles available for export.

lacm

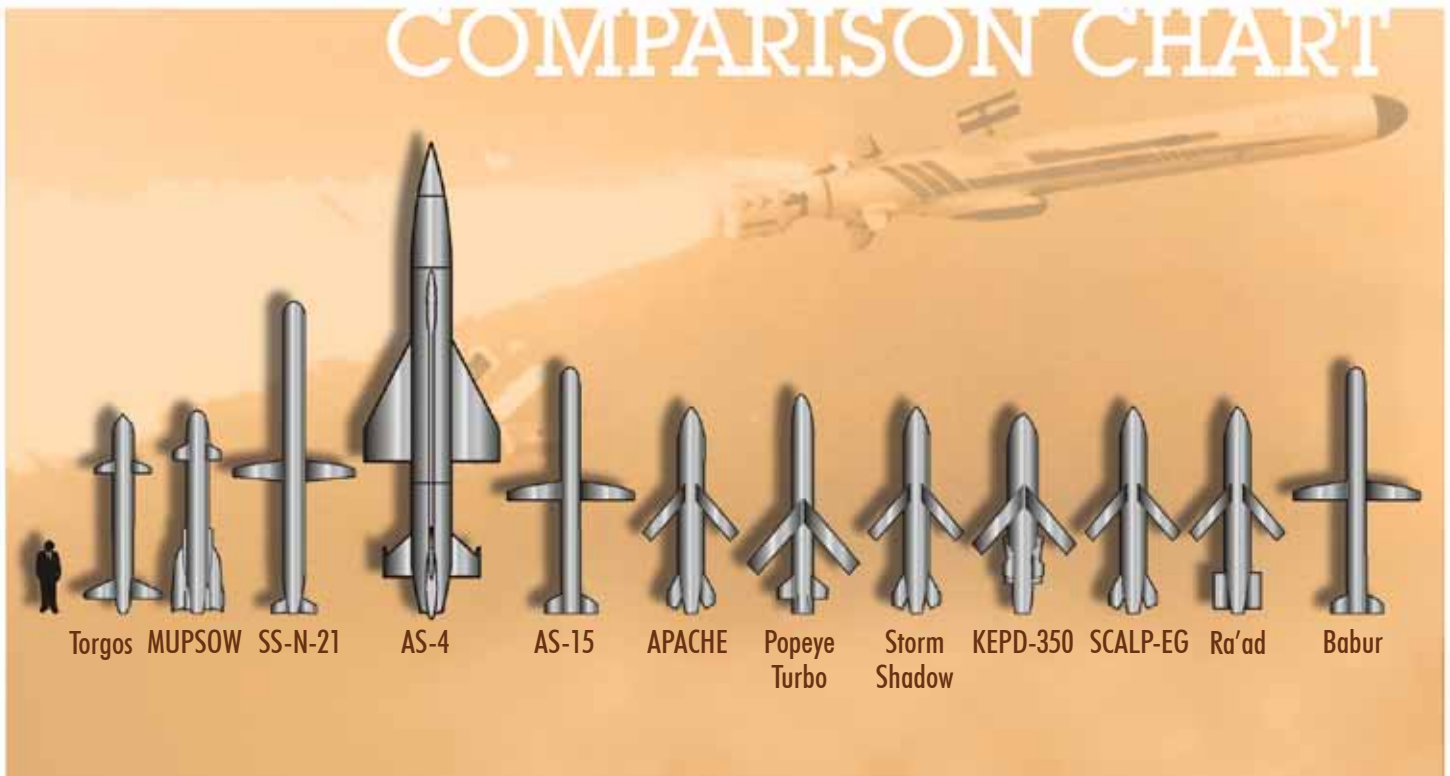
efficient manner. For example, multiple missiles can attack a target simultaneously from different directions, overwhelming air defenses at their weakest points. Furthermore, LACMs may fly circuitous routes to get to the target, thereby avoiding radar and air defense installations. Some developmental systems may incorporate chaff or decoys as an added layer of protection, though concealment will remain a cruise missile's main defense. The cruise missile threat to US forces will increase over the next decade. At least nine foreign countries will be involved in LACM production during the next decade, and several LACM producers will make their missiles available for export.

The success of US Tomahawk cruise missiles has heightened interest in cruise missile acquisition in many countries. Many cruise missiles available for purchase will have the potential to perform precision-strike missions. Many of these missiles will have similar features: a modular design, allowing them to be manufactured with a choice of navigational suites and conventional warhead options; the incorporation of stealth technology; the ability to be launched from fighter-size aircraft; and the capability to fly high-subsonic, low-altitude, terrain-following flight profiles.

The cruise missile threat to US forces will continue to increase. At least nine foreign countries will be involved in LACM production during the next decade, and several of the LACM producers will make their missiles available for export.

The CJ-10 (DH-10) is the first of the Chinese Changjian series of long-range missiles and LACMs. It made its public debut during a military parade in 2009 and is currently deployed with the Second Artillery Corps.

Russian/Indian Brahmos LACM Launch



Pakistani Babur LACM Launch

German Taurus LACM (KEPD-350)

Iran recently announced the development of the 2,000-km range Meshkat cruise missile, with plans to deploy the system on air-, land-, and sea-based platforms.

The Club-K cruise missile "container launcher" weapons system, produced and marketed by a Russian firm, looks like a standard shipping container. The company claims the system can launch cruise missiles from cargo ships, trains, or commercial trucks.

The first flight test of the Brahmos, jointly developed by India and Russia, took place in June 2001. India plans to install Brahmos on a number of platforms, including destroyers, frigates, submarines, maritime patrol aircraft, and fighters. Russia and India are also working on a follow-up missile, the Brahmos 2, which was flight-tested in 2012.

Pakistan continues to develop the Babur (Hatf-VII) and the air-launched Ra'ad (Hatf-VIII). Each missile was flight tested in 2012.

Russian Kh-101/Kh-102 LACMs on Test BEAR H Bomber

CLUB-K Container Missile System

lacm CHARACTERISTICS

MISSILE	LAUNCH MODE	WARHEAD TYPE	RANGE (km)	IOC
CHINA				
YJ-63	Air	Conventional	Undetermined	Undetermined
DH-10	Undetermined	Conventional or nuclear	Undetermined	Undetermined
FRANCE				
APACHE-AP	Air	Submunitions	100+	2002
SCALP-EG	Air and ship	Penetrator	250+	2003
Naval SCALP	Sub and surface ship	Penetrator	250+	2013+
UAE				
BLACK SHAHEEN*	Air	Penetrator	250+	2006
GERMANY, SWEDEN, SPAIN				
KEPD-350	Air	Penetrator	350+	2004
INDIA, RUSSIA				
Brahmos 1	Air, ground, ship, and sub	Conventional	less than 300	2010+
Brahmos 2	Air, ground, ship, and sub	Conventional	less than 300	2013+
ISRAEL				
Popeye Turbo	Air	Conventional	300+	2002
PAKISTAN				
RA'AD	Air	Conventional or nuclear	350	Undetermined
Babur	Ground	Conventional or nuclear	350	Undetermined
RUSSIA				
AS-4	Air	Conventional or nuclear	300+	Operational
AS-15	Air	Nuclear	2,800+	Operational
SS-N-21		Nuclear	12,800+	Operational
Kh-555	Air	Conventional	Undetermined	Undetermined
Kh-101	Air	Conventional	Undetermined	2013
3M-14E	Ground, ship, and sub	Conventional	275	Undetermined
SOUTH AFRICA				
MUPSOW	Air and ground	Conventional	150	2002
Torgos	Air and ground	Conventional	300	Undetermined
TAIWAN				
Wan Chien	Air	Conventional	250+	2006
HF-2E	Ground	Conventional	Undetermined	Undetermined
UNITED KINGDOM				
Storm Shadow	Air	Penetrator	250+	2003
IRAN				
Meshkat	Air, ground, and ship	Conventional	Undetermined	Undetermined

Note: All ranges are approximate and represent the range of the missile only. The effective system range may be greatly increased by the range of the launch platform.

*The BLACK SHAHEEN is an export version of the SCALP-EG.

SUMMARY

Overall, the threats posed by ballistic missile delivery systems are likely to continue to increase and grow more complex over the next decade. Current trends indicate adversary ballistic missile systems are becoming more mobile, survivable, reliable, and accurate while also achieving longer ranges. Prelaunch survivability is also likely to increase as potential adversaries strengthen their denial and deception measures and increasingly base missiles on mobile sea- and land-based platforms. Adversarial nations are adopting technical and operational countermeasures to defeat missile defenses. Ballistic missiles are already in widespread use and will continue to increase in number and variety. The availability of weapons of mass destruction for use on ballistic missiles vastly increases the significance of this threat.

Despite an ongoing reduction in the size of the Russian strategic missile force, Russia probably will retain the largest force of strategic ballistic missiles outside the United States. The development of new ballistic missile systems is a high priority for Russia. Russian officials have claimed that a new class of hypersonic vehicle is being developed to allow Russian strategic missiles to penetrate missile defense systems. Russia tested a new type of ICBM in 2012 and has stated it is developing a new heavy liquid-propellant ICBM to replace the aging SS-18. Russia is also offering the advanced new Iskander-E SRBM for export.

China is producing technologically advanced ballistic missiles and has sold ballistic missile technology to other countries. China has an extensive theater missile program and has deployed a large force of ballistic missiles in the vicinity of Taiwan. China is expanding the reach of this force

Ballistic and cruise missiles, with their relatively low operating costs, their potential to penetrate defense systems, and their value as a symbol of national power, will continue to be the offensive weapons of choice for many nations. As such, they are threats that must be carefully considered in future military planning and operations.

to attempt to prevent foreign powers from becoming involved in any future regional conflict. China can already target the United States with a relatively small force of ICBMs. Its ICBM force will grow quantitatively and qualitatively.

North Korea is continuing development of the TD-2 ICBM/SLV, has unveiled a new road-mobile ICBM, has an IRBM in development, and maintains a large SRBM inventory. North Korea has exported ballistic missile systems and will probably continue to do so.

Iran has ambitious ballistic missile and space launch development programs and continues to attempt to increase the range, lethality, and accuracy of its ballistic missile force. Iranian ballistic missile forces continue to train extensively in highly publicized exercises. These exercises enable Iranian ballistic missile forces to hone wartime operational skills and evolve new tactics. Iran is fielding increased numbers of theater ballistic missiles, improving its existing inventory, and is developing the technical capability to produce an ICBM.

The proliferation of LACMs will expand in the next decade. At least nine countries will be involved in producing these weapons. The majority of new LACMs will be very accurate, conventionally armed, and available for export. The high accuracy of many LACMs will allow them to inflict serious damage, even when the missiles are armed only with conventional warheads. US defense systems could be severely stressed by low-flying stealthy cruise missiles that can simultaneously attack a target from several directions.

Chinese CSS-5 MRBM Road-Mobile Launchers

Russian SS-25 ICBM Launch

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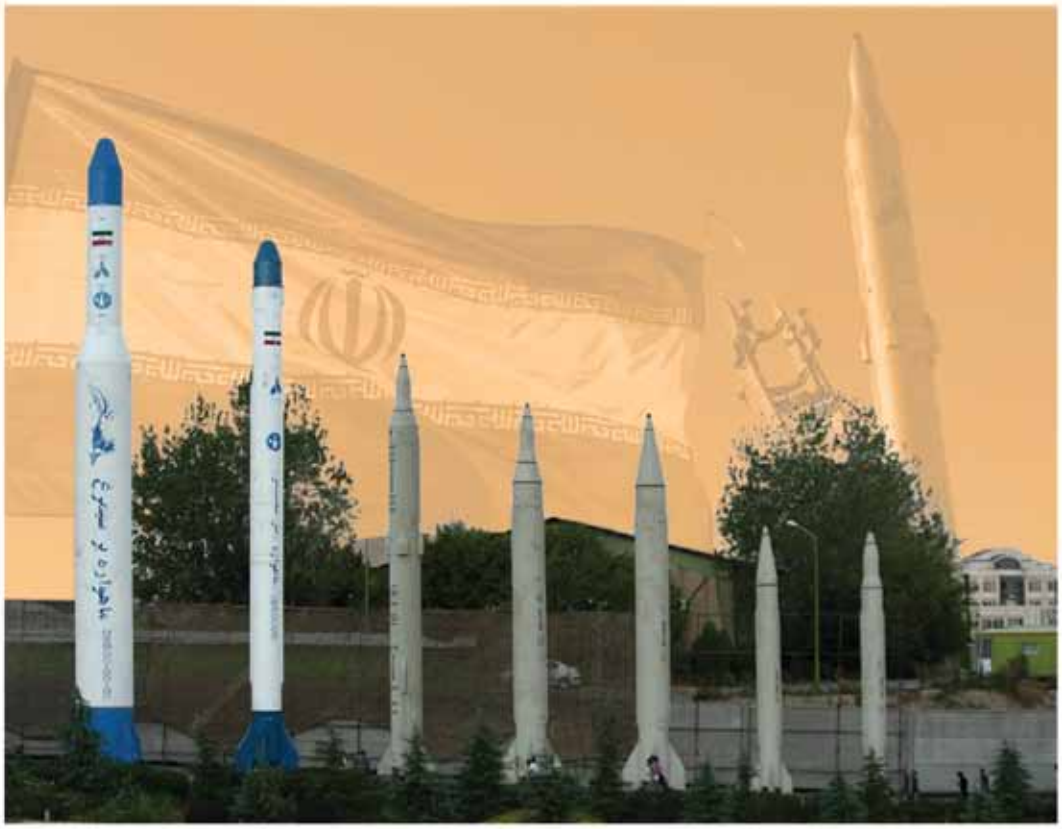

NASIC
PUBLIC AFFAIRS OFFICE

NASIC/PA
4180 WATSON WAY
WRIGHT-PATTERSON AFB, OH 45433-5625

(937) 522-6600

national air and space intelligence center
wright-patterson air force base